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**A Physical Fitness and Training Guide for Young Canadians**

# **get fit·keep fit**

**Fitness and Amateur Sport Directorate**

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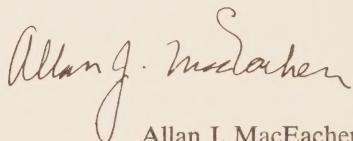
## **Foreword**

This Guide for Young Canadians has been prepared by a Joint Committee of the Canadian Medical Association, and the Canadian Association for Health, Physical Education and Recreation.

The main purpose of the booklet is to encourage and help the nation's youth in maintaining and improving its own state of physical fitness.

The CMA-CAHPER fully endorse a well planned activity program as an aid to fitness; this does not mean that all young Canadians can or should become super athletes or even champions. Rather, it is their hope that this booklet will assist young Canadians in meeting easily the most exacting physical demands of normal living — at work or at play.

We wish to acknowledge the work of Dr. Michael S. Yuhasz, Associate Professor of Physical Education at the University of Western Ontario, who prepared the original material in this booklet.



Allan J. MacEachen,  
Minister,  
National Health and Welfare.



## **Table of contents**

### **Part I**

Why be physically fit? .....	6
What is physical fitness? .....	7
How can fitness be attained? .....	7
How can physical fitness be measured? ....	8
How does training affect the body? .....	8

### **Part II**

Some basic health rules .....	9-11
-------------------------------	------

### **Part III**

Modern training methods .....	11-24
-------------------------------	-------

### **Part IV**

Questions and answers .....	24
Suggested references .....	28

## Part I

### Why be physically fit?



If you were asked to name several people whom you considered to be physically fit you might include an N.H.L. star, an Olympic mile gold medalist, a world's champion figure skater, or even one of the astronauts. Why? Because each has trained his whole body to perform physical tasks related to his specialty at a level of efficiency beyond that attained by the average person.

Naturally, few people will ever reach this state of physical efficiency. And yet, most young Canadians would like to be able to engage in hard, prolonged physical effort in sports or on the job with a minimum of fatigue — and with enough energy left to perform well in overtime or leisure time activities.

Famous mountain climbers do not attack mighty mountain peaks in order to become fit. They have to *be* fit in order to become the first men ever to perform these seemingly impossible tasks. Conditioning and practice in mountain climbing techniques are part of a careful intensive training plan. With a specific goal like this in view, the motivation to submit to a strenuous training program is obvious.

But apart from the training necessary for some specific goal, there are many reasons for regular physical exercise:

- to prepare the body to meet the daily physical demands of normal living — working and playing.
- to prepare for a season of play in an active all-out effort.
- to maintain the body in good physical condition between periods of intensive training for some special sport.
- to enjoy more fully the fun of actively competing with and against others — or against a mountain, lake or river.

Physical exercise and/or recreation is a method of "recharging your batteries" when work, study, worry or boredom tend to "drain" them. In fact, keeping fit may be likened to keeping a battery fully charged so that any physical emergency can be met with confidence and success.

## What is physical fitness?



Physical fitness means different things to different people. In scientific study, for example, the physiologist may consider fitness as being related to the heart, blood vessels, respiratory or muscular systems because he is interested in the effects of exercise on the body.

A coach on the other hand thinks of fitness in relation to the level of conditioning for the particular sport an athlete is playing. The fitness training of world champion sprinters differs a great deal from that which an Olympic hockey team undergoes — and the kind of physical preparation for figure skating championships will not resemble that for competitive swimming.

Throughout all these various approaches to physical fitness, there is a common concern for one thing — work output.

We can describe your physical fitness, then, as being the ability to undertake daily physical tasks and engage in a favourite sport, without undue fatigue. Obviously, a high degree of fitness will be the major factor in the interest, enthusiasm, enjoyment and success you may expect to experience in your personal efforts.



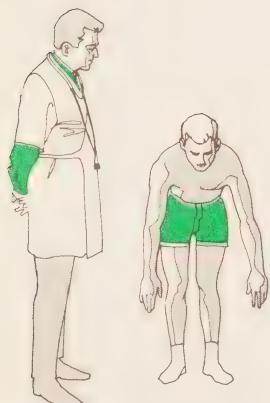
## How can physical fitness be attained?

The only way physical fitness can be attained is through regular physical activity. The kind and intensity of activity, and the amount of time devoted to it will determine the level you can reach. Generally speaking, there are two kinds of physical activity: exercise programs like the 5BX and XBX for strengthening muscle groups and improving endurance; and games or sports of a recreational or competitive nature.

The key factor in the intensity of activity is that of *progression* from lighter to more strenuous work. Your body will adjust without complaints as you gradually increase the demands you make upon it. The amount of time to be spent on physical activity



## How can physical fitness be measured?



## How does training affect the body?

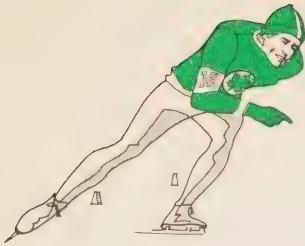
is difficult to state without knowing the specific goals you are seeking. To maintain a good level of general physical fitness, however, a half hour of strenuous activity daily is advisable.

Think of your physical fitness in terms of *levels* on a personal scale. By seeking to maintain a level of general physical fitness throughout the year, you will then be able to raise your fitness level, readily, efficiently, and economically to the peak required for a satisfactory season of competition.

There are two general ways of measuring your level of physical fitness. One is to subject yourself to laboratory tests in which instruments are used to measure components like strength and cardio-respiratory (heart-lung) efficiency. Research workers in physical education use dynamometers to measure the strength of muscle groups. Heart rate recovery and oxygen-usage measures are obtained for prescribed work loads. Like exhaustive medical examinations, such elaborate tests are not readily available.

A second way of measuring the present state of your ability to do work is by recording your performance in any one of a number of test batteries now available. Just remember that such tests have most meaning to you when you use them to check changes in your own level before, during, or after a prescribed period of exercise and training. Factors like skill and motivation enter the picture to limit the value of comparing your results with those of other persons.

The term "training" refers both to the practice of skills and physical conditioning. Through the former, the improvement of techniques increases the mechanical efficiency of the body. This means economy of effort — the beginning swimmer or



skater tires more quickly than the expert when both do the same amount of work.

Physical conditioning of the body improves the ability to use oxygen in the muscle tissues. As body muscles are used, they increase in size and strength; additional blood vessels are brought into use.

When the conditioning includes endurance work (work which makes demands on heart and lungs), the whole oxygen transporting system is improved. There develops an increase in heart muscle, a slower heart rate, and a larger output. Better ventilation of the lungs occurs along with a quicker recovery to normal breathing after strenuous exercise.

A person in good physical condition responds quickly and more efficiently to the demand for work. He can stand heavy muscular effort over long periods of time and recovers quickly without undue fatigue when the exercise or work is completed.

## Part II

### Some basic health rules

#### Don't forget your annual 'check-up'

Before proceeding with a discussion of training methods there are a few basic health rules that apply to all young people whether in training or not.

An annual physical examination is recommended. If the same doctor examines you each time he is the best judge of how complete an examination is necessary.

#### A word about cleanliness and sanitation

Everyone should bathe thoroughly at least every second day and *always* after strenuous exercise. It is a good idea after a hot shower to finish with a cool one to prevent chilling when going out into the cold. There should be a change of underclothing at least every two days. Athletes should pay special

attention to the cleanliness of their uniforms and equipment, using only their own towels and changing these at least twice weekly. Plenty of hot water and soap will prevent many of the minor ills of the athlete in training.

## A balanced diet is a must



The importance of a well-balanced diet in normal life as well as in fitness and training programs goes without saying. But what is meant by a well-balanced diet?

Generally the number of calories we require to keep our bodies functioning efficiently and to maintain body weight depends upon the work we are doing. The average caloric intake of an athlete in training may approximate 4000-5000 calories per day. The rise and fall in an athlete's weight is the best guide to the adequacy of caloric intake. Calories are derived from the carbohydrates, proteins and fats in foods. During exercise the muscles make use of carbohydrates (sugars and starches) almost exclusively and certainly until all the stored carbohydrate (in the form of glycogen) is used up. For this reason adequate amounts of carbohydrate are vitally important in the diet of all young people. Protein (meat, fish, cheese) is necessary for the replacement and repair of body tissues but little is stored in the body. Contrary to popular belief, protein is of little value as a source of energy and should be taken sparingly immediately before competition.

Fat is not so important except as a source of calories and it is likely that we obtain enough fat in our carbohydrate and protein foods such as milk, meat, cheese, to satisfy our requirements.



A balanced diet, therefore, such as laid down in Canada's Food Rules which supplies carbohydrate, protein and fat, is derived from fruit, vegetables, milk, meat, eggs, cheese, butter, fish and whole grain cereals. These foods, taken in balanced proportions, also contain sufficient vitamins and min-

erals for the demands of ordinary living or when in training. Sunshine is a ready source of Vitamin D. Controlled exposure to sunlight is desirable, but over-exposure should be avoided.

## Sleep — try and get eight hours

The amount of sleep required varies with each individual. At least eight hours is recommended for anyone in training; in addition, short periods of rest and relaxation during the day are advisable. One of the first signs of 'overtraining' is inability to sleep.

## The importance of immunization

Fitness in itself does not prevent the illnesses against which we can be immunized. Everyone should be protected against smallpox, tetanus (lockjaw), diphtheria, and poliomyelitis. It is a good plan to discuss your immunizations occasionally with a doctor to determine if your protection is up to date.

## Take care of your teeth

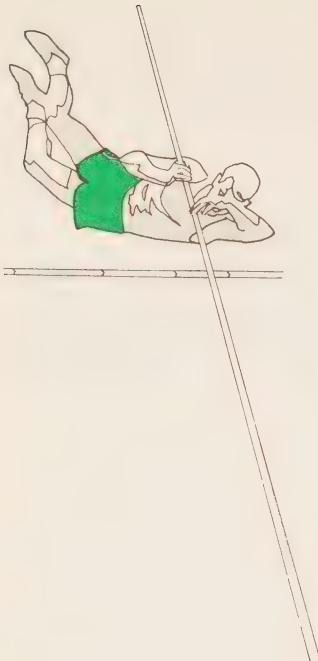


Brushing the teeth two or three times daily and attendance at your dentist at least once yearly are simple ways of ensuring good dental health. The extensive use of foods such as crusty breads, apples, carrots, which call for good hard chewing, is excellent for gums and teeth. Excessive amounts of sweets and soft drinks should be avoided. There is a hereditary factor in the development, preservation and health of teeth and often in spite of good care as outlined above, some teeth deteriorate. In these cases your dentist should be consulted more frequently and his advice followed implicitly.

## Part III

### Modern training methods

During recent years there has been a sustained assault upon world records in sports such as swimming, track and field, skiing, and skating. Undoubtedly, performances in team activities like hockey



and basketball have also improved. This improvement in performance is caused by:

- 1) improved techniques
- 2) athletes working much harder now than in the past
- 3) improved equipment like the fibre-glass pole now used in pole-vaulting
- 4) a more scientific approach to the conditioning of athletes.

The purpose of the remainder of this pamphlet is to present briefly a description of three of these modern training techniques. These are *interval training*, which is a technique aimed primarily at the development of cardio-respiratory (heart-lung) efficiency; *weight training*, and *isometric exercises*, which aim at the development of strength.

Although usually associated with athletes and better sports performances, these programs may also be used by young people who wish to achieve a higher level of physical fitness. Athletes will probably seek higher levels of performance and use exercises specific to their sports, but others may use any of these training routines to maintain a personal level of fitness.

## Interval training

The term "interval training" applies to a sports training technique in which a period of work is followed by an interval of rest. It is used extensively in endurance sports like track and swimming. The intensity of work is gradually increased during the training season in preparation for competition. Repetitious exposures to stress are met by physiological adjustment so that more and more work can be accomplished. Ultimately, the runner runs faster or the swimmer splashes to a new record.

Interval training, as presently used by athletes, is carefully controlled with respect to speed, distance

and rest. The ancestor of what we know as interval training was “speed play” which developed in the Scandinavian countries in the 1920’s. A runner, using the “speed play” system would run at different speeds when his spirit moved him regulated by his subjective feelings at the time.



Gradually a more systematic technique developed; and “controlled interval training” originated with Waldemar Gerschler, of Germany. This was used by many European track coaches just prior to World War II. Since then the use of interval training has become very widespread and is used in some form by almost all successful runners and swimmers. Two of the first athletes to achieve international success with this technique were Emil Zatopek, the great Czechoslovakian distance man, who won three gold medals at the 1952 Olympic Games, and Dr. Roger Bannister, the first man to run a mile in less than four minutes.

In addition to its use in track and swimming, interval training may be applied to conditioning for other sports; and it may be used by anyone who is interested in improving his cardiovascular fitness.

## Variables in interval training

The following items can be controlled in interval training, for example:

- i) the *distance* of each work interval. A runner training for a mile may run 440's or 220's.
- ii) the *speed* at which each work interval is performed. This might be 90% of maximum, 80%, etc.
- iii) the *rest* interval. The time between work interval may be 1 minute, 45 seconds, etc. In track the runner usually continues walking or jogging.
- iv) the *number of repetitions* of the work interval. A runner may run 8, 10 or 12 440's, etc.

## Principles of interval training

Although there are several interval training plans used successfully by different coaches, the following principles are generally adhered to by most:

- the stress of interval training is generally increased by manipulating the four variables.
- speed or intensity of effort appears to be more important than the other variables. It seems to be more important to run fast than it is to run a great distance.
- under-distances are most frequently used. That is, work distances are usually  $\frac{1}{4}$  to  $\frac{1}{2}$  the distance of the athlete's event.
- specific interval training plans must be based upon the ability and the events of an individual. Therefore, a runner training for a mile would not follow the same program as one training for a  $\frac{1}{4}$  mile race.

## A plan for a four minute mile

Suppose that you are a 4:30 miler and you hope eventually to run a 4:00 mile. The following chart outlines in large steps how you might go about trying to achieve this in a systematic fashion. The only distance shown here is a quarter-mile work interval and the rest period is cut down very quickly. This, as you undoubtedly realize, will take a long time. Present best time — 4:30 minutes.

Step	Mile Objective	Objective Each 440	Rest	No. of Work Periods
1	4:28	1:07	1:00	Build to 12
2	4:28	1:07	:45	Lower to 10
3	4:28	1:07	:30	Lower to 8
4	4:28	1:07	:25	Lower to 6
5	4:28	1:07	:00	Lower to 4
6	4:24	1:06	1:00	Build to 12
7	4:24	1:06	:45	Lower to 10
8	4:24	1:06	:30	Lower to 8
9	4:24	1:06	:15	Lower to 6
10	4:24	1:06	:00	Lower to 4
11	4:20	1:05	1:00	Build to 12
12	4:20	1:05	:45	Lower to 10
13	4:20	1:05	:30	Lower to 8
14	4:20	1:05	:15	Lower to 6
15	4:20	1:05	:00	Lower to 4
36	4:00	1:00	1:00	Build to 12

## Some applications of interval training



An athlete uses interval training, under the direction of his coach, as part of his training program. It is the best system for anyone who wants to improve his cardiovascular condition. In addition to the systematic plan just outlined, here are some other interval training plans for people with different activity interests, or with no facilities available to them:

- i) If a track is not available, you can run around the block and walk around the block; or, in the pool, you can swim two lengths fast and then scull two lengths. In all instances you should try to apply the principles previously outlined.
- ii) Another approach to interval training is the boy scout technique of running the distance between two telephone poles and then walking the distance between the next two.
- iii) Cyclists may use interval training by pedalling vigorously for a block and then coasting for a block.
- iv) It is possible to use interval training by running in place for one minute and then resting for one minute, and so on. Another indoor method is to step up-and-down on a chair for a minute, then rest for a minute, and repeat. A third is to run up a set of stairs as fast as you can, walk down slowly, and repeat.

## Weight training

Prior to World War II most physical educators and coaches regarded the use of weights as an activity indulged in only by those persons interested in the development of the "Body Beautiful". It was generally believed that weight training held no advantages for either the person interested in personal fitness development or for the athlete interested in improved athletic performance. The consensus among physical educators and coaches was that

the use of weights resulted in “muscle boundness”. It was believed that the muscle-bound athlete would lose speed, co-ordination and flexibility. This, of course, would result in poorer performance.

During World War II weight exercises were used very successfully in the rehabilitation of men in the armed forces and it was found that the previously mentioned danger of becoming “muscle-bound” did not exist in a properly organized and conducted weight training program. Thus, weight training, a strenuous exercise system, involving the use of weights and other resistance devices, evolved as a training technique for use in Physical Rehabilitation Programs. It differs from weight lifting which is generally regarded as a competitive sport.



Weight training has now been accepted by most physical educators and coaches as a means of developing strength generally and in certain specific muscle groups. Athletes in a wide variety of sports are using weight training programs, designed especially for their sport. Swimmers are using weights and are swimming faster, high jumpers are using weights and are jumping higher and coaches from almost every sport are attempting to employ weight training in the development of their athletes. In addition weight training programs are now being used by girls and women who are interested in improving their figures.

## **Advantages and uses of weight training**

(i) *Increased Strength.* Strength, the ability to exert force, is a great advantage to everyone. When applied to sport, it results in improved performance. For example, a football player with strong legs is able to block harder. Also, a certain amount of strength is necessary to carry out efficiently a number of daily tasks, e.g. picking up and carrying a box of groceries from the store to the car.



(ii) *Increased Power.* Power, the ability to exert a force quickly, is closely related to strength. Power is usually measured by such tests as the standing broad jump or vertical jump. That the athlete benefits from increased power in many sports is quite evident. The basketball player can jump higher for rebounds, the high jumper can jump higher and the swimmer can dive farther at the start of the race.



(iii) *Appearance.* Weight training results in both an increase of the strength of muscles and in the hypertrophy (enlargement) of muscles. For example, strong abdominal muscles aid anyone, from the young child to the middle-aged businessman, to hold his stomach in. It is not suggested that you commence a weight training program with the sole aim of developing bulging muscles.

(iv) *Safety.* The strengthening of specific muscle groups prior to competition in a contact sport such as football reduces the likelihood of injury. For example, two such muscle groups in football would be those of the neck and the knee.

(v) *Rehabilitation.* Weight training exercises are used extensively in the rehabilitation of muscles and joints weakened by injury or after surgery. In such cases, weights allow for careful control of progressive rebuilding exercises.

## Principles of weight training

1. *Overload.* Weight training is built upon the "overload" theory. According to this theory a muscle only increases in strength when it has to work against a resistance that results in the muscle exerting itself. If the muscle can easily overcome the resistance, then no increase in strength will occur. If an increase in strength is desired it is necessary to increase the resistance against which the muscle is working. At the present time, research is being conducted to determine just how much a muscle should be overloaded to produce maximum strength gains.



2. *Range of Movement.* Weight training exercises should be done so that the weight is carried through the full range of movement necessary to produce the desired result. This will help eliminate the problem of increasing muscle strength in only one part of a movement.

3. *Safety.* Safety is of prime importance in weight training. Factors which must be considered, in addition to being fit enough to take part, are:

- (a) Care must be exercised at all times when handling weights and only weights which can be lifted without danger should be handled.
- (b) A specific area for weight training should be provided.
- (c) A proper warm-up should be taken before weight training.
- (d) Equipment should be properly constructed and properly maintained.

4. *Specificity.* More and more evidence is accumulating with respect to the specific efforts of exercise programs. This is particularly true with respect to weight training. An athlete should seek the advice of a coach or a reputable source before beginning a weight program. He should not start on a haphazard program. A suggested program is outlined for the individual aiming at personal fitness development.

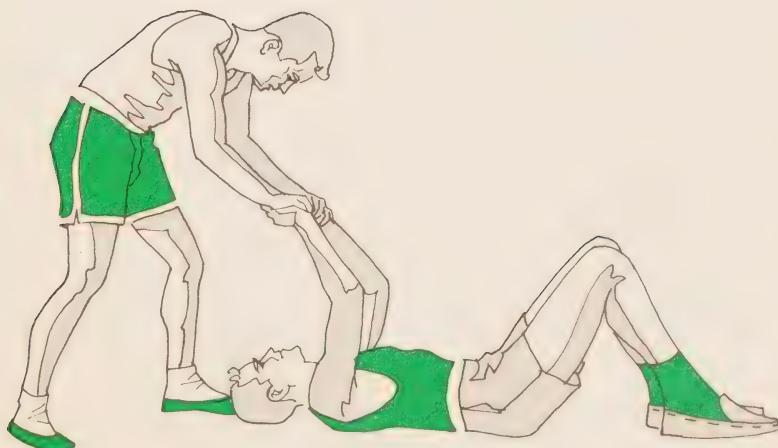
5. *Workout Pattern and Schedule.* It is suggested that an individual at the beginning of a weight training program experiment and find a weight that he can lift six times. This must be done for each exercise and should be recorded. He works with this weight usually 3 times per week, until he can lift it 10 times. This series of 6 to 10 repetitions is referred to as a *Set*. When the individual can do 10 repetitions he adds 10% of the weight being used and returns to six repetitions. It is recommended that an accurate record of performance be kept.

## A general weight training program

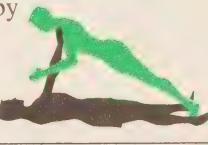
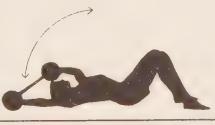
Here is a general weight training program designed for the person interested in improving his general fitness and physical appearance. Although it is easier to train with standard weights, it is not possible in some situations because of either cost or large numbers. It is possible to improvise weights by filling large fruit juice cans or paint cans with cement joined with a steel bar which is inserted before the cement dries. This costs about \$.70 and results in a thirty-five pound weight. Other improvisations include old fly wheels joined by steel bars and bags of sand. The main difficulty with improvised equipment is that it is not possible to adjust the weights. Therefore, several sets of varying weights are required.

Other techniques, which may be used if no equipment is available, are to use partner exercises. In this technique one partner does the exercise while the other offers resistance through the full range of motion.

The following program illustrates how these exercises may be done using either weights or as partner exercises.



Exercise	Description
1. Arm Curl	<ol style="list-style-type: none"> <li>1. Stand with arms against thighs</li> <li>2. Palms face forward</li> <li>3. Bend elbow so that bar comes to chest</li> <li>4. Return</li> </ol>
2. Lateral Raise	<ol style="list-style-type: none"> <li>1. Stand with arms against sides</li> <li>2. Palms inward</li> <li>3. Lift sideways 45° above horizontal</li> <li>4. Return</li> </ol>
3. Forward Arm Raise	<ol style="list-style-type: none"> <li>1. Stand with arms against thighs</li> <li>2. Palms in</li> <li>3. Lift forward 45° above horizontal</li> <li>4. Return</li> </ol>
4. Bench Press	<ol style="list-style-type: none"> <li>1. Lie with back on bench</li> <li>2. Barbell across chest</li> <li>3. Fully straighten arms</li> <li>4. Return</li> </ol>
5. Sit-ups	<ol style="list-style-type: none"> <li>1. Lie on back</li> <li>2. Weight behind head</li> <li>3. Feet bent down</li> <li>4. Knees bent</li> <li>5. Bring forehead to knees</li> </ol>
6. Trunk extension	<ol style="list-style-type: none"> <li>1. Legs straight</li> <li>2. Bend forward at waist and grasp weight</li> <li>3. Straighten back</li> </ol>
7. ¾ Squat	<ol style="list-style-type: none"> <li>1. Stand straight</li> <li>2. Weight on shoulder</li> <li>3. Go down to ¾ squat</li> <li>4. Straighten legs</li> </ol>

Purpose	Diagram-Weight	Diagram-Partner
To strengthen the biceps	Front 	Presses down 
To strengthen shoulder muscles middle deltoid supraspinatus		One side at a time—pressure then full range 
To strengthen anterior deltoid, pectoralis major, clavicular portion		Offer resistance through full range 
To develop musculature of chest and arm extensors		Hands on shoulders. Posture can vary resistance by position of feet. 
To develop abdominal muscles		Resistance on shoulders. 
To strengthen back muscles		Feet hooked. 
To strengthen leg muscles		Piggy Back Drill. 

## **Isometric exercises**

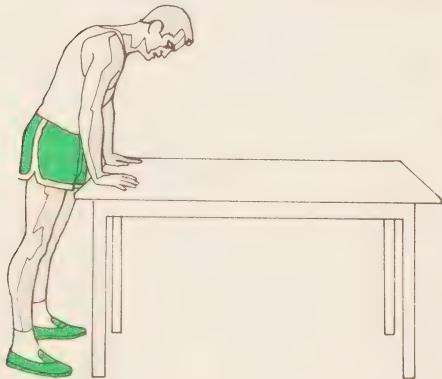
Isometric exercises are exercises in which no shortening of the muscle occurs. They are used to develop strength. Their chief advantages are that they do not require any equipment and it is possible to do them in a limited period of time.

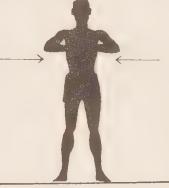
## **Principles of isometric exercises**

- i) Isometric exercises are done without any shortening of the muscles.
- ii) Isometric exercises are generally done by pressing against or pulling on an immovable object such as a wall or by using the individual's own body.
- iii) The usual pattern in isometric exercises is to contract the muscles for six seconds and then relax them for six seconds (for example, press down on a table for six seconds as hard as you can and then relax). This is repeated ten times.
- iv) Isometric exercises develop strength in the specific position in which they are done. Therefore, it is necessary to use exercises throughout the full range of motion and to do exercises for the whole body.

## **A set of isometric exercises for the person interested in general fitness**

The following isometric exercises are designed to develop strength in those areas considered by most people to be important in attaining general fitness. The athlete, who is interested in specific exercises for his sport, will have to seek advice from his coach. The preceding principles should be applied when doing the following exercises.



Exercise	Purpose	Description	Diagram
1. Arm Curl	To strengthen biceps	<ol style="list-style-type: none"> <li>1. Elbows against sides.</li> <li>2. Hands extended in front parallel to floor.</li> <li>3. Standing—use low bar in gym or seated use heavy desk or table.</li> <li>4. Lift up—keep elbows in.</li> </ol>	
2. Lateral Raise	To strengthen shoulder muscles	<ol style="list-style-type: none"> <li>1. Stand in doorway.</li> <li>2. Back of hands against sides of doorway.</li> <li>3. Attempt to move arms out.</li> <li>4. Keep arms straight.</li> </ol>	
3. Forward Arm Raise	To strengthen shoulder muscles	<ol style="list-style-type: none"> <li>1. Hands extended in front of body parallel to floor. Keep the elbows straight.</li> <li>2. Standing—use low bar in gym or seated use heavy desk or table.</li> <li>3. Lift up—keep elbow straight.</li> </ol>	
4. Hand Push	To strengthen arm extensors (triceps)	<ol style="list-style-type: none"> <li>1. Palms together in front of chin.</li> <li>2. Push in.</li> </ol>	
5. V-Sit	To strengthen abdominal muscles	<ol style="list-style-type: none"> <li>1. Sit on floor on back with hands at sides.</li> <li>2. Lift both legs and shoulders off ground.</li> </ol>	
6. Trunk Extension (Back arch)	To strengthen back muscles	<ol style="list-style-type: none"> <li>1. Lie in prone position with hands behind head.</li> <li>2. Lift both feet (legs straight) and shoulders off ground.</li> </ol>	
7. ¾ Squat	To strengthen leg muscles	<ol style="list-style-type: none"> <li>1. Stand in doorway on chair or low bar.</li> <li>2. Put hands on top of doorway.</li> <li>3. Hold ¾ squat position.</li> <li>4. Push up with legs.</li> </ol>	

## **Other exercise programs**

In addition to the modern training techniques which have been outlined there are a number of other exercises which can be used in the development of physical fitness by everyone. These include 5BX and XBX, circuit training and calisthenic programs. References to these are found in the back of this booklet.

### **Part IV**

#### **Common questions and answers**

##### **What do I eat to improve my performance?**

Here are some answers to questions on exercise, training and physical fitness which are often asked by young people.

Numerous studies have shown that the diet required by an athlete does not differ from that of the non-athlete with the exception of the number of calories. The athlete because he is working hard will consume more calories than the average person. Practices such as consuming steak dinners before competition, eating glucose prior to competition, or sipping on orange juice and honey during competition are *of little or no benefit*.

##### **What is oxygen debt?**

An oxygen debt is incurred when an individual takes part in an athletic activity or exercise program in which he requires more oxygen than he can take in. Therefore, the individual works anaerobically (without oxygen) and it is necessary for him to repay this debt upon completion of the exercise. A high oxygen debt is built up in such activities as sprinting a 100, 220, 440, or swimming a 100 yard freestyle, or playing hockey at top speed for 1 or 2 minutes. As you can see an oxygen debt is usually built up in short sprint activities.



## **What is meant by the 'natural' athlete?**



The so-called 'natural' athlete is one endowed with certain factors which may aid his physical performance. Heredity sets the limits, for example, in body build, height, leg and arm lengths, and total amount of muscle. To some extent, the ability to use oxygen in the tissues, muscle power and co-ordination may also be inherited.

While it is true that some of these natural endowments are important in some sports (such as height in basketball and weight in football), nevertheless environmental factors contribute greatly to success in athletics. Included among these are training, motivational desire to succeed, and the opportunity to play. It isn't the inheritance you have that counts, so much as what you do with what you have.

## **What causes muscle cramps?**

Cramps usually occur in the foot, calf, or thigh and may be due to build-up of waste products (lactic acid) or to exposure to cold, or to inadequate circulation caused by restrictive clothing or equipment. Some cramps are difficult to explain.

## **Is warm-up important before performance?**

Warm-up by heat or movement before exercise is important, since it tends to bring muscles up to body temperature, and to help the body adjust to work. It will result in better performance and will decrease the possibility of injury. The specific type warm-up depends upon the activity but usually should include stretching exercises followed by practice of the skills of the activity.

## **Should one taper off or 'warm down' after an athletic contest?**

There seems to be some merit in this procedure. The muscles should be kept active for a short time after the event in order to avoid stiffness. Tapering off is easy to practice, takes a short time and should be used much more than it is now.

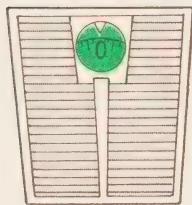
## **When should the last meal before competition be eaten?**

Large bulky meals should be avoided before any strenuous exercise and especially before competition. It is best to eat a small meal preferably high in carbohydrates about two hours before the exercise.

## **Swimming after meals?**

There is no evidence that cramps or drowning occur any more frequently within an hour or so of meals than at any other time. Other strenuous exertion is often undertaken after meals without harmful effects. One must remember, though, the limitations on breathing and digestion.

## **Weight control?**



Diet and exercise are the two most important factors in the control of weight. If the intake of calories approximates the number expended during work or exercise, weight will remain constant. There are, however, abnormal conditions in the body which affect this balance and before attempting to alter your weight you should be certain that none of these abnormalities are present. It is true, though, that most overweight people are also inactive and out of condition.

## **How much water should a person who exercises strenuously drink?**

Ordinarily the feeling of thirst is the best guide as to whether fluids are needed by the body — stepping up fluid intake beyond demands or withholding it does not improve athletic performance. Taking other than several sips of fluid during a game is likely to interfere with playing efficiency.

## **What about 'pep pills' and athletes?**

The use of these 'pills' is not ethical nor is it comparable with the idea of physical and mental fitness. A well-known case of toxicity from these stimulants contributed to the death of an Olympic athlete.

## **Should any drugs be taken by the athlete in order to induce sleep?**

Ordinarily sedatives should not be required by a well-trained athlete. If, due to nervous tension, a restful sleep is not possible other methods of diversion, or alteration of training routines, should be tried first. If these are unsuccessful, a mild sedative might be given on the recommendation of a doctor.

## **Why is the use of alcohol frowned upon by trainers and coaches?**

Abuses to the body caused by alcohol are in direct conflict with the whole concept of the physically fit person. There is no medical evidence to show that alcohol contributes anything at all to the improvement of an athlete's performance.

## **Why is smoking considered an undesirable practice for athletes participating in strenuous activities?**

A good deal of medical evidence indicates that smoking is harmful to health. Increased heart rate, nervous tension and irritation of membranes of the throat and lungs are effects which may well prevent an individual from attaining the level of physical fitness he is striving to reach.

## **What athletic activities are suitable for girls?**

Girls and women should be encouraged to take part in sports and games just as boys and men should. Strenuous efforts in sports are not harmful as has been shown by our female athletes in swimming, track and field, skiing, figure skating, volleyball, basketball, to name just a few. Co-educational games such as tennis and badminton are especially recommended.

## **What effect does physical training or exercise have on the menstrual function?**

Menstruation is a normal body function and, in most cases, the usual physical activities need not be interrupted. Even the occasional sluggishness of the early period may be helped by moderate exercise. More than usual fatigue, excessive flow and general discomfort may, however, suggest some



curtailing of activities; generally, girls need not feel that they are 'sick'. Any variation from a normal pattern should be discussed with a doctor.

## Suggested references

The following references are sources for specific exercise programs and for exercise programs not outlined in this pamphlet.

American Association for Health, Physical Education and Recreation. *Weight Training in Sports and Physical Education*. Editorial Committee: Frank D. Sills, Laurence E. Morehouse and Thomas L. Delorme. Washington: 1962.

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